

Acadian Geology: the Geological Structure, Organic Remains, and Mineral Resources of Nova Scotia, New Brunswick, and Prince Edward Island. By J. W. DAWSON, M.A., LL.D., &c. &c. &c. Second Edition, revised and enlarged; with Geological Map and numerous Illustrations. 8vo. London, 1868.

WE have before us three new and greatly enlarged editions of important geological works, of which geologists may well be proud, as showing the advance of the science and the manner in which first-class writers can and do treat of it, and of which geologists also assuredly make every-day use, both at home and abroad, in the cabinet and in the field. One of these noble works is purely philosophical, giving the principles on which the science is founded; the others magnificently and in detail show the application of these principles in the study of the structure, history, and capabilities of large portions of the globe.

All geologists know the value of Lyell's 'Principles of Geology,' the object of which is well expressed in its title—namely, to elucidate the causes and history of those changes on the earth's surface that have been, by a careful study and full exposition of the changes we can now recognize as taking place in both the organic and the inorganic world. Without this idea of the continuous and similar, but ever-varying, operations of natural agencies, the Philosophy of Geology would be wanting in its leading principle. In Sir Charles's own words, "The 'Principles' treat of such portions of the economy of existing nature, animate and inanimate, as are illustrative of geology, so as to comprise an investigation of the permanent effects of causes now in action, which may serve as records to after-ages of the present condition of the globe and its inhabitants. Such effects are the enduring monuments of the ever-varying state of the physical geography of the globe, the lasting signs of its destruction and renovation, and the memorials of the equally fluctuating condition of the organic world. They may be regarded, in short, as a symbolic language, in which the earth's autobiography is written." Besides this special subject, the work before us gives us the historical sketch of the early progress of geological knowledge, which has served as a mine for all popular writers on geology; also "a series of preliminary essays to explain the facts and arguments which lead me," says the author, "to believe that the forces now operating upon and beneath the earth's surface may be the same, both in kind and degree, as those which at remote epochs have worked out geological changes." With this principle is bound up the personal interest of this excellent and charming book. Excellent in its original plan, in its steady growth and advance through riper and riper editions, and charming in its perfect English, elegant style, and fascinating hold upon the reader. Without some legitimate bias, some special aim, the best-written book may prove merely a heavy work of reference. A thread for the necklace, a string to bind the bouquet, a persistent idea in a scientific work, connecting the collected facts and notions as a philosophic whole, is requisite

to ensure the fulness of beauty, aroma, and perfection that can be attained. The doctrine of Uniformity in the series of past changes in the animate and the inanimate world, then, is the living thought that gives completeness of form and a charming spirit to Sir C. Lyell's 'Principles of Geology.' Every phenomenon of nature with which the geologist has to do, whether great or small, commonplace or wonderful, has its character and bearings studied fully and candidly, without the superstition and bonds of antiquity, on one side, leading us back to the mythic period of geology, and without the seeming cold-heartedness of ultra-positivism, on the other; and all are made to show how long, how steadily, how ceaselessly, how perfectly the world's work has been carried on. As the chief expounder of the disputed doctrine of Uniformity, Sir Charles stands on the highest point in the field of discussion, beyond, perhaps, most of his followers; for some almost give up the hope of finding palæozoic mammals, some are weak in their belief in the absence of greater heat-agency in early times, and some begin to limit the earth's age, as a cooled globe, to a hundred million years or so; but it is well that his position should be clear to all good thinkers, if not perfectly incontrovertible; and, indeed, he fairly uses all his facts for the support of his view, without lessening their value to those who, thinking differently, have to thank him for the conscientious care and painstaking labour by which he has brought together all that bears on the subject-matter of the 'Principles,' from books, from people, and his own researches. The sources of information are indicated by many footnotes, and in the text too, or have been referred to in earlier editions; and, indeed, it must be a matter of grave consideration to a geological writer now-a-days as to the extent to which references to published notions and descriptions should be introduced in the pages of a new work, unless he is anxious to leave popular writers and compilers no excuse for their careless habit of quoting opinions and statements at second hand, from such large and leading works as that before us, and referring them to a wrong authorship, instead of going to the fountain-heads in special memoirs and journals for the adopted facts and views. To those who take up a scientific subject for the first time, it is easy to refer details, principles, and all to a favourite author, or perhaps to their only manual or book of study—anticipating the time when the science will be so far advanced that its accepted principles, formulæ, and practice will be universally applied, and pass, without reminder, as the result of the labours and thoughts of nearly forgotten men. Whilst, however, the science is still imperfect, let each geologist, be he gatherer of facts or builder of hypotheses, have the credit as well as the responsibility of his contributions to the general stock of knowledge. This is our author's practice; and hereby his work indicates the progress of modern geology among his contemporaries, as it supplies avowedly a history of geological thought and research in former times.

The author himself supplies a list of the principal additions and corrections in this the tenth edition of the 'Principles.' In vol. i., the ninth chapter, on the progressive development of organic life,

has been entirely rewritten, and the broad features of fossil faunæ, favourable to the doctrine of "progressive development" or of "progressive evolution," are fairly stated, and the probability of other data turning up in favour of "uniformity" is also insisted on, as well as "the unvarying constancy of the laws of nature," enabling us to reason "from the present to the past in regard to the changes of the terrestrial system, whether in the organic or inorganic world." The tenth, eleventh, twelfth, and thirteenth chapters are also quite new, treating of the changes of climate,—1st, as proved by reference to successive and different geological formations, 2ndly, as resulting from various geographical conditions, and, 3rdly, as possibly caused by astronomical changes, such as variations in the excentricity of the earth's orbit, changes in the obliquity of the ecliptic, and different phases of the precession of the equinoxes. Mr. Croll's suggestion as to the probable effects of a large excentricity in producing glacial epochs is fully discussed, and the question is entertained whether geological dates may be obtained by reference to the combined effects of astronomical and geographical causes. Many points illustrative of changes in the inorganic world, now in progress, are elucidated in this volume with new woodcuts, or with the description of new facts, or both. The enlargement and emendation of those chapters comprised in the second volume, and treating of volcanic phenomena and earthquakes, and of the changes of the organic world now in progress, are very extensive. Under the first-mentioned head comes the subject of upheaval and subsidence of large areas of the earth's surface, the internal condition of the earth, metamorphic rocks, &c. Under the other heading we have several rewritten chapters,—on Lamarck's theory of transmutation, Darwin's 'Origin of Species' and 'Pangenesis,' Natural and Artificial Selection (Darwin's hypothesis being fully accepted), geographical distribution of animals and plants, the extinction of species, &c. The forty-third chapter is devoted to the consideration of Man, his origin and distribution, calmly treated, and leading to the clear belief in man's uprising by progressive development from a lower stage of being, and adopting the fact of early man having been totally ignorant and barbarous.

"We are sometimes tempted to ask whether the time will ever arrive," says our veteran and thoughtful teacher (p. 493), "when science shall have obtained such an ascendancy in the education of the millions that it will be possible to welcome new truths instead of always looking upon them with fear and disquiet, and to hail every important victory gained over error, instead of resisting the new discovery long after the evidence in its favour is conclusive. The motion of our planet round the sun, the shape of the earth, the existence of the antipodes, the vast antiquity of our globe, the distinct assemblages of species of animals and plants by which it was successively inhabited, and, lastly, the antiquity and barbarism of Primeval Man,—all these generalizations, when first announced, have been a source of anxiety and unhappiness. The future now opening before us begins already to reveal new doctrines, if possible more than ever out of harmony with cherished associations of thought. It is therefore desirable, when we contrast ourselves with the rude and superstitious savages who preceded us, to remember, as cultivators of

science, that the high comparative place which we have reached in the scale of being has been gained step by step by a conscientious study of natural phenomena, and by fearlessly teaching the doctrines to which they point. It is by faithfully weighing evidence, without regard to preconceived notions, by earnestly and patiently searching for what is true, not what we wish to be true, that we have attained that dignity which we may in vain hope to claim through the rank of an ideal parentage."

The nature of fossils of all sorts, from the microscopic siliceous atoms of the lowest plants to the bony remains of Man, their relations to the materials in which they are imbedded, the causes of their burial, and their distribution in agreement with the terraqueous conditions of the earth's surface at any given time, past or present, form matter enough for the always interesting chapters towards the conclusion of the work; and they have had their share of amendment and augmentation.

In fact, in this elaborate work we have a series of well written and philosophical essays on several branches of natural history, closely related one to another, to the gradual formation of the existing surface of the globe, and to its foregone changes and future modifications. This is an exhaustive work, complete, and without a rival. Elegant in style, perspicuous, and far from pretentious, this masterly book is read by many not studying geology as a science; for it gives a clear account of many natural phenomena in which Man has a deep and common interest.

Murchison's 'Siluria,' having almost as wide a circulation as the 'Principles,' is also well known to geologists, amateur and professional, though it is more technical, and treats specially of certain rock-formations and fossils. The wide extent, however, to which Silurian strata reach in the different quarters of the globe—the fullness and accuracy with which these strata and their fossils are described and delineated—the many elucidations of the bearings that these have theoretically on the philosophy of geology, on one hand, and practically on the structure and capabilities of different hills, plains, and regions, on the other, render this "unrivalled *résumé* of all that is known about the Lower Palæozoic rocks and fossils, all the world over," indispensable to many and attractive to others. It contains also a comprehensive sketch of the Upper Palæozoic formations, their history and their relationships, comprising valuable notices of the geology of several parts of Britain, Germany, &c., where such rocks abound. Moreover the interesting and practically useful subject of gold and its distribution has a very careful and comprehensive chapter devoted to it; and an essay on geological succession (showing the very gradual out-coming of the higher kinds of animals), and on the intensity of some natural operations in former times, complete this grand work. The improvements in this new edition are very extensive, and are mainly noticed in the author's preface, where, moreover, as also in the text, he takes care to enumerate as far as he can the manifold sources of information and aids to knowledge that his contemporaries have supplied him

with. Our acquaintance is enlarged now with the great and old Laurentian formations of Canada, thanks to the Geological Survey of that country, and with synchronous rocks in Scotland, Bohemia, and elsewhere, as worked out by Gümbel, Murchison himself, and others—with far more of the so-called “Primordial” fauna of the *Lingulella*-flags and the corresponding beds in Bohemia than formerly known, thanks to Barrande, Salter, Hicks, and others—with a clearer view of the Caradoc-Bala series and its intercalated volcanic masses, thanks to our Geological Survey—with improved notions respecting the Middle and Upper Silurian rocks and fossils, thanks to Salter, Davidson, and many others—and so forth. The clearing up of the doubt as to the real geological place of *Telerpeton Elginense*, *Hyperodapeton*, and *Staganolepis*, of the upper Sandstones near Elgin, now determined to be Triassic, is a great gain. The clear notices of the nature and relations of the palæozoic rocks of the Pentlands and of Ayrshire, by Mr. Geikie, are also highly acceptable; and the more exact knowledge of the Palæozoic rocks of the Continent, from the communications of De Prado, Collomb, De Verneuil, Kjerulf, Dahll, Barrande, Helmersen, and others—and of those of Canada and America also, by Logan, Hall, Billings, Bigsby, &c., add greatly to the value of this edition.

“Lastly,” writes Sir Roderick, “after taking a general view of the history of the different races of animals which have succeeded to each other during all geological periods, I have, in the last chapter, added a brief sketch of my long-cherished convictions respecting many of the former physical and mechanical changes of the earth’s surface, as contrasted with any movements which have taken place in historical times;” and well does he argue respecting the great changes the young earth suffered, as proved by the long and deep fractures, extensive dislocations, enormous reversals of crumpled strata, and vast removals of shattered rocks, that such great movements and denudations are inexplicable by reference to the modern action of common earthquakes, volcanoes, rain-wash, and wave-action; and he refers rather to such mighty operations as we have been lately reminded of by the powerful earthquake-wave of Hawaii, rolling in, 60 feet high, for a quarter of a mile, and answering, with its fatal bore, the devastating eruption of Mauna Loa.

Although these two great chiefs among geologists, Murchison and Lyell, differ in opinion as to whether the progressive advance of organic nature has been at a relatively slow or rapid rate, and whether the changes of land and sea, and all the concomitant variations of physical conditions, have taken place violently or gently, in long past periods, these are matters that little concern the actual truths of geology and the application of geological knowledge to the manifold requirements of our age. To the advance of the science and to its practical use each of these noble works is an admirable contribution and aid.

Both of the eminent geologists above mentioned are veterans, fellow-workers forty years ago, when their science was young.

Their labours, indeed, have been great and continuous since then ; and not the least important portion of their work has consisted in directing and helping younger labourers in the same field of research. Among these Dr. J. W. Dawson, Principal of McGill University, Montreal, is eminent. In 1842 Sir C. Lyell visited Nova Scotia, giving and taking information on what he saw in the remarkable sections of coal-beds &c. in the Bay of Fundy and elsewhere, and putting Mr. Dawson and others on the right track towards elucidating the geology of their Province. Great results have followed. Year by year new observations were made, authenticated, and published, chiefly in the 'Journal of the Geological Society of London,' until, a few years since, Dr. Dawson published his 'Acadian Geology;' and now, with greatly increased material, collected and made known by himself and others, he has brought out what is rather a new work than a new edition, so much enlarged, enriched, and so much more complete is the present thick volume of nearly 700 pages.

Acadia or Acadie is the old and beautiful name, derived from a Micmac (native Indian) word meaning the "place" or "place of abundance," applied by the early French colonists to what is now known as Nova Scotia, New Brunswick, and the neighbouring islands ; and, distinct in its natural arrangement and produce from Canada on the one hand, and from the United States on the other, this water-cut region deserves its special and appropriate name. So the author thinks, and he cordially hopes the name Acadia will live, and that the region will in the end assert its natural preeminence. A general account of the Acadian provinces is followed by a description of the deposits of the modern period, including submarine forests, remains of prehistoric man, and other interesting matters—showing how rapidly some of the changes of the surface, due to alterations of drainage and burning of forests, may have taken place. The Boulder-clay and other deposits of the Glacial period, with the remains of *Mastodon* &c., are next noticed and illustrated. These lie on the Triassic rocks, which, with their trap-rocks, useful minerals, fossil plants, and reptilian remains, are fully treated of. After noticing the Permian blank, Principal Dawson takes up the Carboniferous period and its wondrous accumulation of fossil fuel and other deposits, with its minerals, physical characters, and its fossils both of animal and vegetable origin. Eleven chapters are not too much for this rich subject, on which the author has devoted many years of labour and acute research, and from which he has extracted a vast store of information, both for palæontologists in particular and for geologists at large. He has reconstructed several of the strange trees and plants of the period, and brought together the shattered remnants of many reptiles, with two kinds of land-shells and a centipede. But these are already known to reading geologists. The Devonian rocks in this portion of the American continent are richer in plants than those of Europe and Britain ; and several insects, too, as well as plants, have been discovered in them by the geologists of New Brunswick. Dr. Dawson's remarkable plant, the *Psilophyton*, is mainly of Devonian age, though some older fragments

of it are found in the Upper Silurian. The Silurian, Huronian, and Laurentian rocks are also found in Acadia, and have been elucidated by Dr. Honeyman, Mr. Hartt, and others. The economic geology of the region is kept well to the fore, also its physical geography and agricultural characteristics, as dependent on its geological structure. Many subjects of great interest in general geology are illustrated or described in this volume, especially the nature of coal, the flora of the coal, preservation of erect trees, origin of gypsum, life in seas, estuaries, &c., trails, rain-marks, and footprints, albertite, gold, primeval man, &c. Upwards of 270 woodcuts, mostly excellent in character, a good geological map, and, lastly, several lists of contents, special subjects, and illustrations, a valuable appendix, and useful index complete this satisfactory, well-written, and well-printed work on the geology and geological resources of Acadia. These large and varied provinces possess enthusiastic enlightened geologists, and furnish fields as rich for their research as the unprecedented supply of gold which Nova Scotia offers to the miner. It must be a mutual satisfaction to our Acadian brethren and ourselves to have at command this handsome and elaborate *résumé* of all that is known of the geology of that important region.

PROCEEDINGS OF LEARNED SOCIETIES.

ROYAL SOCIETY.

June 11, 1868.—Lieut.-General Sabine, President, in the Chair.

“On the Osteology of the Solitaire or Didine Bird of the Island of Rodriguez, *Pezophaps solitaria* (Gmel).” By ALFRED NEWTON, M.A., Professor of Zoology and Comparative Anatomy in the University of Cambridge, and EDWARD NEWTON, M.A., Auditor-General of Mauritius.

The Solitaire of Rodriguez was first satisfactorily shown to be distinct from the Dodo of Mauritius (*Didus ineptus*) by Strickland in 1844, from a renewed examination of the evidence respecting it, consisting of the account given by Leguat in 1708, and of the remains sent to France and Great Britain. Strickland, in 1848, further proved it to be generically distinct from the Dodo. The remains existing in Europe in 1852 were eighteen bones, of which five were at Paris, six at Glasgow, five in the possession of the Zoological Society (since transferred to the British Museum), and two in that of Strickland, who, at the date last mentioned, described them as belonging to *two* species, the second of which he named *Pezophaps minor*, from the great difference observable in the size of the specimens. In 1864 one of the authors visited Rodriguez, and there found in a cave two more bones, while a third was picked up by a gentleman with him. All these bones have been described, and most of them figured, in the publications of the Zoological Society, and in the large work of Strickland and Dr. Melville*.

* The Dodo and its Kindred. London: 1848, 4to.